

REMARKS

The undersigned Attorney thanks the Examiner for his time and consideration during a personal interview conducted on August 9, 2003.

Applicant has deleted claims 142 and 144-146, amended claims 141 and 143, and added claims 147-150. In summary, the Teder reference, US Pat. No. 5,700,204 only teaches the determination of an object's one dimensional velocity by monitoring the object's movement on a CURVILINEAR path. Teder teaches the determination of movement of the object based on the determined one dimensional velocity. The one dimensional velocity is determined by modeling the expected effects of gravity, aerodynamic lift, and aerodynamic drag on the object. These expected effects curve the object's movement path as the effects become significant relative the object's initial velocity vector. For example, when a golf ball is struck well by a driver, the ball's initial velocity is about 180 mph and its acceleration vector is significantly greater than the gravity acceleration, aerodynamic lift acceleration, and aerodynamic drag acceleration. Consequently, the initial movement path of such a struck object (golf ball in the example) is substantially NON-curvilinear.

The method taught by Teder requires energy to be reflected off the object while the object's movement path is measurably influenced by the to-be-modeled effects, i.e., during a CURVILINEAR segment of the movement path. The Applicant's claimed invention either claims the determination of an object's movement path based on monitoring the object during a NON-curvilinear segment or determines a three dimensional velocity vector. The Applicant's claimed invention, by employing multiple sensors/transmission paths determines the object's

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movement characteristics by observing the object during a Non-curvilinear movement segment or by determining the object's three dimensional velocity vector.

The Mihran reference, US Pat. No. 6,244,971 teaches the determination of an object's back spin rate or off-axis rotation level by 1) transmitting energy PARALLEL to the object's expected movement path, 2) placing one or more NON-SYMETRICAL contrast region areas on the object and aligning the contrast regions to be parallel to the object's expected movement path and 3) determining the object's back spin rate or off-axis rotation level by observing the modulation of the reflected energy, the modulation due the contrast regions periodically changing the received, reflected energy level as the contrast regions rotate in and out of the transmitted energy path. See FIG. 1A – 1E in the attached drawing. In these figures, the object is rotating backwards (back spin) and illustrative reflective energy (for energy projected parallel to the object's rotation plane). As shown, the energy level varies as the contrast rotates in and out of view the energy projected on the object. The Applicant's claimed invention either claims the determination of an object's movement path based on reflected energy transmitted NON-PARALLEL to the object's expected movement path or determines a three dimensional velocity vector. Mihran teaches placing the contrast region parallel to the expected movement path. Accordingly, when energy is transmitted NON-parallel to the expected movement path, the reflected energy would NOT be periodically modified (modulated) by the Mihran taught contrast regions. In addition, if the Mihran taught contrast regions were placed Non-parallel to the expected movement path (this is not taught by Mihran) and energy is transmitted NON-parallel to the expected movement path, the reflected energy would be NOT be periodically modified or modulated by the Mihran taught contrast regions. In particular, the non-parallel energy would be constantly amplified by the

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contrast regions. See FIG. 2A to 2E where the object is rotating backward in the plane of the paper and energy is directed at the plane of the paper, i.e. Non-parallel to the object's movement path. In this illustration, the reflected energy would be nearly constant. The algorithm taught by Mihran for determining the back spin rate or level of off-axis rotation would not work for non-parallel energy (no modulation).

Claim 124:

Claim 124 recites:

A method of determining one of a movement direction, spin rate, and spin axis orientation of an object, the object having a movement path section that is **substantially non-curvilinear**, comprising the steps of:

- a) aligning a plurality of electro-magnetic energy transmission paths to be **non-parallel** to the object's **substantially non-curvilinear** movement path section;
- b) reflecting electro-magnetic energy from each of the plurality of transmission paths off the object for at least a portion of the **substantially non-curvilinear** movement path section;
- c) receiving the electro-magnetic energy reflected off the object from each of the plurality of transmission paths; and
- d) determining one of a movement direction, spin rate, and spin axis orientation of the object based on the reflected electro-magnetic energy received from each of the plurality of transmission paths and while the object was traveling in the at least a portion of the **substantially non-curvilinear** movement path section.

In view the substantial differences between the invention recited by claim 124 and the Teder and Mihran references (non-curvilinear movement path and non-parallel energy transmission paths), Applicant respectfully contends that claim 124 is not anticipated or obvious in view of these references.

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Claims 125-129:

Claims 125-129 are directly or indirectly dependent on claim 124. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204, '533, and '971 references. Claim 126 additionally recites that a contrast mark applied to the object is symmetrical. The Mihran reference teaches the use of non-symmetrical contrast marks. Claim 129 recites that there are at least three transmission paths. The Teder and Mihran references do not teach the use of three or more transmission paths. In view of these additional substantial differences and previously recited differences, Applicant respectfully contends that claims 125-129 are also not anticipated or obvious in view of the Teder and/or Mihran references.

Claim 130:

Claim 130 recites:

A method of determining one of the spin rate and spin axis orientation of a moving object, the object having a movement path section, comprising the steps of:

- a) applying an electro-magnetic-contrasting mark to the object;
- b) aligning a plurality of electro-magnetic energy transmission paths to be non-parallel to the object's movement path section;
- c) reflecting electro-magnetic energy off the object from the plurality of electro-magnetic energy transmission paths;
- d) receiving the electro-magnetic energy reflected off the object from the plurality of electro-magnetic energy transmission paths; and
- e) determining one of the spin rate and spin axis orientation of the object based on the received electro-magnetic energy from the plurality of electro-magnetic energy transmission paths.

The Teder reference does not teach how to determine a spin rate or spin axis orientation. The Teder reference assumes that the spin rate is nominal in order to perform curve fitting analysis. In view the substantial differences between the invention recited by claim 130 and the Teder and

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Mihran references, Applicant respectfully contends that claim 130 is not anticipated or obvious in view of these references.

Claims 131-133:

Claims 131-133 are directly or indirectly dependent on claim 130. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204, '533, and '971 references. Claim 131 additionally recites that a contrast mark applied to the object is symmetrical. Claim 133 additionally recites that a plurality of symmetrical contrast marks are applied to the object. In view of these additional substantial differences and previously recited differences, Applicant respectfully contends that claims 131-133 are also not anticipated or obvious in view of the Teder and/or Mihran references.

Claims 134-140:

Claims 134-140 are apparatus claims that parallel the method claims 124-133. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the Teder and/or Mihran references.

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Claim 141:

Claim 141 (as amended) recites:

A ball adapted for determination of one of the ball's movement direction, spin rate, and spin axis orientation, comprising:

a symmetrically shaped area having an electro-magnetic contrast different from the ball remainder, the area configured to enable the determination of a **three dimensional velocity vector** based on electro-magnetic energy reflected off the ball from a plurality of transmission paths and one of the ball's movement direction, spin rate, and spin axis orientation based on the **three dimensional velocity vector**.

Neither Teder nor Mihran teach the determination of the three dimensional velocity vector of an object for any application. In view of the substantial differences between the invention recited by claim 141 and these references, Applicant respectfully contends that claim 141 is not anticipated or obvious in view of these references.

Claim 143:

Claim 143 is dependent on claim 141. Consequently, Applicant respectfully contends that this claim is also not anticipated or obvious in view of the Teder and/or Mihran references. Claim 143 additionally recites that the mark is circular. As noted, the Mihran teaches the use of non-symmetrical contrast marks. In view of this additional substantial difference and previously recited differences, Applicant respectfully contends that claim 143 is also not anticipated or obvious in view of the Teder and/or Mihran references.

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Claim 147:**Claim 147 (as amended) recites:**

A method of determining one of a movement direction, spin rate, and spin axis orientation of an object, the object having a movement path, comprising the steps of:

- a) reflecting electro-magnetic energy from a plurality of transmission paths off the object for at least a portion of movement path section;
- b) receiving the electro-magnetic energy reflected off the object from each of the plurality of transmission paths; and
- c) determining a **three dimensional velocity vector** for the object;
- d) determining one of a movement direction, spin rate, and spin axis orientation of the object based on the **three dimensional velocity vector**.

Neither Teder nor Mihran teach the determination of the three dimensional velocity vector of an object for any application. In view the substantial differences between the invention recited by claim 147 and these references, Applicant respectfully contends that claim 147 is not anticipated or obvious in view of these references.

Claim 148-150:

Claims 148-150 are directly or indirectly dependent on claim 147. Consequently, Applicant respectfully contends that this claim is also not anticipated or obvious in view of the Teder and/or Mihran references.

While Applicant has made a diligent effort to place the claims in condition for allowance, should there remain unresolved issues that require adverse action it is respectfully requested that the Examiner telephone Merle Richman, Applicant's Attorney at 858 320-2030 so that such issues may be resolved as expeditiously as possible.

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For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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Date



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